

REMARKS

The Official action mailed 6 May 2009, has been received and its contents carefully noted. The pending claims, claims 2-12, were rejected. By this Response, claims 2 and 12 have been amended to clarify that the electrolyte solution comprises a salt and an acid in solution. Claim 3 has been canceled as being redundant to amended claim 2. Claims 4-11 have been amended to improve their readability by deleting “the” before “claim” and to make them dependent on claim 2 instead of canceled claim 3. Support may be found in the original specification and claims. No statutory new matter has been added. Therefore, entry of the amendments and reconsideration in view of the following remarks are respectfully requested.

The Claimed Invention

Applicants respectfully submit that the claimed invention is directed to a method of preparing low molecular weight chitosan oligosaccharides using an electrolyte solution which comprises a salt and an acid in solution and microwave irradiation.

Applicants unexpectedly discovered that using an electrolyte solution comprising a salt and an acid in solution in combination with microwave irradiation consistently, reliably, and efficiently degrades chitosan into chitosan oligosaccharides having a molecular weight of 600~30000 Da.

No New Issues for Consideration

Applicants respectfully submit that the amendments to the claims do not raise any new issues for consideration. Specifically, as set forth in the Office action, the Examiner already interpreted the electrolyte in the claims as comprising a salt, e.g. NaCl, and an acid as set forth in former claims 3, 4 and 6. Therefore, Applicants respectfully submit that the amendments to the claims should be entered and considered.

Rejection under 35 U.S.C. 103(a)

The Examiner rejected claims 2-12 under 35 U.S.C. 103(a) as being unpatentable over Li (CN J. Biochem. Pharma, 2002, 23(3):132-133) in view of Yokota (JP 63-182304) and Kolupavev (Fizilogia, 1991, 23(3):267-274). Specifically, the Examiner deemed that it would

have been obvious to make chitosan oligomers via degradation of chitosan by microwave irradiation in the presence of an electrolyte as the Examiner deemed that use of electrolytes and use of microwave irradiation are individually taught in the prior art. In particular, the Examiner stated that Li does not teach or suggest microwave irradiation of chitosan in the presence of an electrolyte and then cited Yokota as teaching the hydrolysis of chitosan in the presence of hydrochloric acid as the electrolyte. The Examiner cited Kolupaev as indicating that a salt, e.g. NaCl, as an electrolyte, is known to increase or assist the hydrolysis of oligosaccharides.

Applicants respectfully submit that the cited documents do not teach or suggest the claimed invention. Specifically, the cited documents, alone or in combination, do not teach or suggest using an electrolyte solution comprising a salt, e.g. NaCl, and an acid in solution in combination with microwave irradiation. In particular, neither Li nor Yokota teach or suggest the hydrolysis of chitosan in the presence of an electrolyte solution comprising a salt and an acid in solution.

Applicants respectfully submit that the Examiner improperly relies on Kolupaev and/or uses impermissible hindsight in order to combine the disclosure of Kolupaev with Li and Yokota. Specifically, it appears that the Examiner does not fully appreciate and/or mischaracterizes the disclosure of Kolupaev. The Examiner stated that Kolupaev indicates that “NaCl (an electrolyte) is known to be an intense hydrolysis of oligosaccharides, or to increase or assist the hydrolysis of oligosaccharides”. This interpretation of Kolupaev is incorrect.

The disclosure and experiments of Kolupaev relate to the impact of salt stress on the enzymatic activity of invertase in wheat coleoptiles. Invertase is an enzyme that catalyzes the hydrolysis of simple sugars. Kolupaev measured the invertase activity by the amount of growth inhibition of the coleoptiles and/or the level of soluble carbohydrates in the coleoptiles in the presence of different NaCl concentrations. Nowhere does Kolupaev disclose or suggest any experiments where the effect of NaCl on oligosaccharides in the absence of invertase. Without such experiments and the fact that invertase catalyzes the hydrolysis of oligosaccharides, Kolupaev does not evidence that NaCl itself increases or assists the hydrolysis of oligosaccharides. Instead, all that can be validly understood from the disclosure of Kolupaev is that varying levels of salt stress (due to varying concentrations of NaCl) results in varying levels

of invertase activity in wheat coleoptiles.

In addition, Applicants respectfully submit that nowhere does Kolupaev disclose anything having to do with chitosan and chitosan oligosaccharides. Chitosan is a polysaccharide which is significantly more complex than a simple sugar, i.e. oligosaccharide. Because Kolupaev does not provide any experimental evidence that NaCl in the absence of invertase will increase or assist in the hydrolysis of oligosaccharides and Kolupaev has nothing to do with chitosan, one of ordinary skill in the art would not have been motivated to use combine the disclosure of Kolupaev with Li and Yokota with a reasonable likelihood of success in preparing low molecular weight chitosan oligosaccharides using an electrolyte solution comprising a salt and an acid in solution and microwave radiation.

Since Li and Yokota do not teach or suggest preparing low molecular weight chitosan oligosaccharides using an electrolyte solution comprising a salt and an acid in solution and microwave radiation, the claimed invention is unobvious. Therefore, the present invention is novel and unobvious and the rejection under 35 U.S.C. 103(a) should properly be withdrawn.

Request for Interview

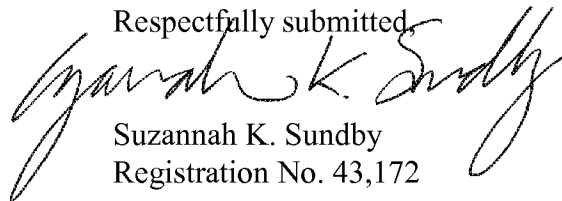
Either a telephonic or an in-person interview is respectfully requested should there be any remaining issues.

CONCLUSION

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Official action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefor are hereby authorized to be charged to **Deposit Account No. 02-4300**, Attorney Docket No. **034176.004**.

Respectfully submitted,



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